

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE																		
BRIEF/WAIST ASSEMBLY, . ITEM 104 ----- 0104-210605- 07/08/09/10/11/12 (1)	2/1RB	104FM02X  Loss of restraint bracket screw.  Defective material; screws, helicoils, or thread lock adhesive.	END ITEM: Loss of one of five screws  GFE INTERFACE: Load is transferred to remaining screws.  MISSION: None for single failure.  CREW/VEHICLE: None for single failure. Loss of crewman with loss of second screw (on same side of bracket) and restraint bracket.  TIME TO EFFECT /ACTIONS: Minutes.	A. Design - Adjustable Bracket (P/N 10271): There are five screws that secure the bracket to the BSC. The attachment screws are fabricated from A-286 stainless steel and are procured to MS or NAS specifications. Analysis has shown that the screws have a minimum safety factor of 2.0 for ultimate tensile failure.  Loss of the bracket screw is precluded by adherence to standard engineering torque requirements for screw installation and the use of thread lock adhesive. Design requirements for proper installation of helicoils are specified in the assembly procedures when helicoils are installed.  B. Test - Acceptance: Component - See Inspection.  PDA: The following test is conducted at the Lower Torso Level in accordance with ILC Document 0111-710112: 1) Proof pressure test at 8.0 +0.2 -0.0 psig to verify no structural damage.  Certification: The adjustable waist assembly was successfully tested (manned) to duplicate operational life (Ref ILC Document 0111-712381). The following use, reflecting requirements of significance to the waist assembly, was documented during certification: <table border="1"> <thead> <tr> <th>Requirements</th> <th>S/AD</th> <th>Actual</th> </tr> </thead> <tbody> <tr> <td>Flexion/Extension</td> <td>1234</td> <td>2600</td> </tr> <tr> <td>Rotations</td> <td>2466</td> <td>5000</td> </tr> <tr> <td>Walking Steps</td> <td>4320</td> <td>8640</td> </tr> <tr> <td>Pressure Cycles</td> <td>300</td> <td>604</td> </tr> <tr> <td>Don/Doff Cycles</td> <td>98</td> <td>204</td> </tr> </tbody> </table> The waist assembly was successfully subjected to a BTA ultimate pressure of 13.2 psid during certification testing (Ref. ILC Doc. 0111-712381). This is 1.5 times the maximum BTA operating pressure of 8.8 psid. During certification testing, the bracket successfully completed testing to a factor of safety of 2.0 without yielding against a S/AD limit load of 911 lbs.  C. Inspection - Components and materials manufactured to ILC requirements at an approved supplier are documented from procurement through shipping by the supplier. ILC incoming receiving inspection verifies that the materials received are as identified in the procurement documents, that no damage has occurred during shipment, and that the supplier certifications have been received which provides traceability information.  The following MIP's are performed during the waist manufacturing process to assure the failure causes are precluded from the fabricated item:  1) The presence of screws, thread lock adhesive, and proper torque are verified	Requirements	S/AD	Actual	Flexion/Extension	1234	2600	Rotations	2466	5000	Walking Steps	4320	8640	Pressure Cycles	300	604	Don/Doff Cycles	98	204
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		104FM02X		<p>during assembly at the EMU processing facility.</p> <p>2) Helicoil installation is verified during source inspection at the supplier.</p> <p>D. Failure History - None.</p> <p>E. Ground Turnaround - During ground turnaround in accordance with the FEMU-R-001, the BSC (while installed in the LTA) is subjected to a visual inspection for loose/missing screws, structural integrity and structural and leakage tests. Additionally, every 229 hours of manned pressurized time, the waist primary axial restraint brackets are removed and reinstalled during which time the screw torque and Loctite application are verified.</p> <p>F. Operational Use - Crew Response - EVA: When CWS data confirms SOP activation, abort EVA.</p> <p>Special Training - Standard training covers this failure mode.</p> <p>Operational Considerations - Flight rule A15.1.2-2 of "Space Shuttle Operational Flight Rules", NSTS-12820 defines go/no go criteria related to EMU pressure integrity. Generic EVA Checklist, JSC-48023, procedures Section 3 (EMU Checkout) and 4 (EVA prep) verify hardware integrity and systems operational status prior to EVA. Real Time Data System allows ground monitoring of EMU systems.</p>

EXTRAVEHICULAR MOBILITY UNIT  
SYSTEMS SAFETY REVIEW PANEL REVIEW  
FOR THE  
I-104 LOWER TORSO ASSEMBLY (LTA)  
CRITICAL ITEM LIST (CIL)  
EMU CONTRACT NO. NAS 9-97150

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